भारतीय मानक

Indian Standard

IS 9859 (Part 3) : 2023

पावर लाइन कैरियर उपकरण की स्थापना और संरक्षण — रीति संहिता

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(पहला पुनरीक्षण)

Installation and Maintenance of Outdoor Power Line Carrier Equipment — Code of Practice

Part 3 Coupling Capacitors/Capacitor Voltage Transformers

(First Revision)

ICS 33.200

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Power System Control and Associated Communications Sectional Committee, LITD 10

FOREWORD

This Indian Standard (Part 3) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Power Systems Control and Associated Communications Sectional Committee will be approved by the Electronics and Information Technology Division Council.

The Standard was originally published in 1983. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards. In addition, the following changes have been made:

a) Cl. 4.4 — Reference to *The Electricity Act*, 2003 and *Central Electricity Authority* (measures relating to safety and electricity supply) *Regulations*, 2018 has been provided.

This Standard is intended to serve as a guide to installation engineers, contractors and users of power line carrier equipment, so far as coupling capacitors or capacitor voltage transformers are concerned.

In view of the consideration that this code is required to be in conformity with the prevailing practice in India, considerable assistance has been derived from *The Electricity Act*, 2003 and Central Electricity Authority (measures relating to safety and electricity supply) Regulations, 2018 while drafting this Standard. Reference to the relevant provisions of The Electricity Rules, 2005 has, therefore, been made at appropriate places with a view to bringing to the notice of the installation and/or maintenance engineer(s) the statutory regulations concerning this work.

This standard (Part 3) covers installation and maintenance of coupling devices. The following are the other parts of this standard:

Part 1 Line traps
Part 2 Coupling devices

The composition of the committee responsible for the formulation of this standard is listed in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INSTALLATION AND MAINTENANCE OF OUTDOOR POWER LINE CARRIER EQUIPMENT — CODE OF PRACTICE

PART 3 COUPLING CAPACITORS/CAPACITOR VOLTAGE TRANSFORMERS

(First Revision)

1 SCOPE

1.1 This Standard covers the code of practice for the installation and maintenance of coupling capacitors/capacitor voltage transformers (CVT) generally used in outdoor installations.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

IS No.	Title
IS 335	New Insulating Oils — Specification
IS/IEC 60358-1 :	Coupling Capacitors and Capacitor Dividers: Part 1 General Rules (*second revision*)

3 TERMINOLOGY

For the purpose of this Standard, definitions given in IS/IEC 60358-1 shall apply.

4 GENERAL REQUIREMENTS

4.1 Before ordering the coupling capacitor/CVT, information shall be exchanged between the owner, switchyard designer, transmission line designer, installation engineer, maintenance engineer and manufacturer so that the coupling capacitor/CVT is procured to suit the duty, location and installation conditions under which it will operate.

4.2 The owner shall obtain well in advance all relevant information about the overall dimensions, weight for transport, installation, etc, of the coupling capacitor/CVT. When the porcelain bushing, base tank and other accessories are separately packed, a packing list and drawings showing the assembly shall be supplied to the user.

4.3 The manufacturer shall provide drawings and instructions for the installation and maintenance of the coupling capacitor well in advance of the time of delivery. It is essential that the installation of the coupling capacitor/CVT as well as its maintenance is performed in accordance with the instructions given by the manufacturer.

4.4 All electrical installations shall comply with the requirements of *The Electricity Act*, 2003 and *Central Electricity Authority* (measures relating to safety and electricity supply) *Regulations*, 2018 made thereunder. If considered necessary, the local authorities concerned in the administration of the rules and regulations in the manner of layout of installation shall be consulted in regard to the rules and regulations that may be applicable.

4.5 Applicable rules and regulations of the concerned local authorities, if any, for the layout of installation shall be observed.

4.6 The installation shall be carried out only by authorized person competent to undertake such work under the rules and regulations that may be in force in different states.

5 INSTALLATION DESIGN

5.1 General

The installation shall be done in such a manner that maximum safety to operational and maintenance personnel is assured.

5.2 Arrangement

5.2.1 Coupling capacitors/CVTs are generally installed outdoors, in upright position, supported on steel or concrete pedestals.

5.2.2 Mounting a line trap on top of the coupling capacitor or CVT may be considered only with the specific approval from the manufacturers of the coupling capacitor/CVT and of line trap.

5.3 Electrical Connections to the Coupling Capacitor/CVT

5.3.1 Depending on the application, the high voltage terminal of coupling capacitor/CVT may be connected to line conductor, cable or bus bar.

5.3.2 In the majority of applications, the connections are made to the transmission line conductor by a ‘Tee’ or parallel groove connectors. Care shall be exercised that excessive lateral forces do not exert a pull on the high voltage terminal.

5.3.3 Manufacturers generally provide alternative positions and types of high voltage terminals. Depending upon the type of installation, an optimum choice of terminals may be made.

5.3.4 Connections to the low voltage terminal shall be made with single bare copper conductor or bare copper strip.

5.4 Clearances

All parts of the coupling capacitor/CVT are considered live and therefore minimum clearances between the coupling capacitor/CVT and other phases and between HV terminals of coupling capacitor/CVT and earth shall be maintained in all conditions. Due allowances shall be given to take care of conductor movements and sagging in worst conditions. The recommended clearances are given in Table 1.

5.5 Rating of Coupling Capacitor/CVT

The rating of the coupling capacitor/CVT shall normally be influenced by the following:

a) For CVTs burden, accuracy and number of windings shall be chosen in consultation with protection and instrumentation\engineers;
b) Voltage rating shall be consistent with system voltage; and
c) Creepage distance shall be chosen consistent with system voltage and shall take into account the pollution levels at the installation site.

Table 1 Minimum Electrical Clearance
(*Clause* 5.4)

System Voltage Rating kV (rms) (1)	Impulse Withstand Level kV (Peak) (2)	Minimum Clearance to Earth (mm) (3)	Minimum Clearance Between Phases (mm) (4)	Minimum Clearance from Any Point where the Man may be Required to Stand to the Nearest Unscreened Conductor in Air (Sectional Clearance) (mm) (5)
36	170	320	400	2 920
	200	375	480	2 970
72.5	325	630	750	3 230
	350	675	810	3 270
123	450	920	1 065	3 520
	550	1 150	1 350	3 750
145	550	1 150	1 350	3 750
	650	1 380	1 600	3 980
245	825	1 800	2 000	4 400
	900	1 960	2 300	4 560
	1 050	2 300	2 700	4 900

Note — The values of 400 kV system voltage rating are under consideration.

6 INSTALLATION

6.1 All items of equipment shall be carefully inspected as soon as possible upon arrival at site to ascertain whether they have been damaged in transit or whether any items are missing. Particular attention shall be paid to the porcelain bushing. The base tank shall be inspected for oil leakages.

6.2 Advice tendered by manufacturers for unpacking and lifting shall be followed to prevent damage. Slinging shall be carried out only at the lifting lugs provided for it.

6.3 In most cases, the base tank is supplied filled with oil. If the base tank is required to be filled, then the proper type of oil as recommended by the manufacturer and/or conforming to IS 335 shall be filled. Before filling with oil, the tank shall be thoroughly cleaned and extraneous material such as packing pieces, if existing, shall be removed. The oil shall be thoroughly clean and dry before being filled into the tank. The oil shall be as warm as the surrounding air and shall be filled either with a centrifuging machine or filter press type machine using flexible hoses. Rubber hoses shall not be used.

6.4 If the capacitor units and base tank are separately supplied, blanking plates are normally fitted on the tank cover and plugs are fitted to the breather pipe to avoid moisture absorption during despatch. During installation, the blanking plate shall be removed. The capacitor units housed in porcelain bushings shall be then fixed over the tank as per drawing. It shall be ensured that there is good contact between the terminals of the capacitor units and between the terminals of the bottom most unit and terminal in the base tank.

NOTE — The correct serial numbers of the capacitor units and base tank shall be ascertained from test reports and assembled accordingly, since the final capacitance values are adjusted in the works for each combination of capacitor units.

The breather, if any, shall then be fitted into position.

6.5 The low voltage terminal (carrier terminal) shall be connected to the drain coil by a single bare copper conductor or bare stiff copper strip.

6.6 The earthing terminals, normally provided on tank sides, shall be connected to the switchyard earthing grid.

7. MAINTENANCE

7.1 For equipment with breather, the breather shall be inspected at intervals of about 3 months, and if the blue silica gel crystals turn pink, these shall be reactivated by heating in an oven at 150°C until the crystals regain the blue colour.

7.2 Coupling capacitor/CVT shall be disconnected from HV supply, at intervals of one year; capacitors shall be discharged and the porcelain insulator inspected and cleaned. If the paint work on the tank is damaged, it shall be repainted. The tank shall be inspected for leaks.

ANNEX A
(*Foreword*)

COMMITTEE COMPOSITION
Power System Control and Associated Communication Sectional Committee, LITD 10

Organization	*Representative(s)*
In Personal Capacity (*New Delhi*)	SHRI PANKAJ BATRA **(*Chairperson*)**
ABB India Limited, Bengaluru	SHRI S. R. VIJAYAN
Bhakra Beas Management Board, Chandigarh	SHRI NAVEEN GUPTA
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Central Power Research Institute, Bengaluru	DR AMIT JAIN SHRI V. SHIVAKUMAR (*Alternate*)
GETCO, Vadodara	SHRI B. B. MEHTA
IEEE India, Bengaluru	SHRI RAVINDRA DESAI
Pillai India Smart Grid Forum, New Delhi	SHRI REJI KUMAR SHRI HARPREET SINGH (*Alternate*)
Indian Electrical and Electronics Manufacturers Association, New Delhi	SHRI J. PANDE SHRI AKEEL KHAN (*Alternate*)
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Indian Institute of Technology, Delhi	SHRI ABHIJIT R. ABHYANKAR
Indian Institute of Technology, Hyderabad	DR PRADEEP KUMAR YEMULA
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Reliance Energy Limited, Mumbai	SHRI BHUSHAN R. CHAUDHARI SHRI VIJAY PANPALIA (*Alternate*)

Organization	*Representative(s)*
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Secure Meters Limited, Gurugram	Shri Madhur Kumar Srivastava
Tata Power Delhi Distribution Limited, Delhi	Shri S. Samanta Shri Anil Kumar Ojha Shri Rastogi (*Alternate*)
Tata Power Limited, Mumbai	Shri Amok Agarwala Shri Ashish P Mhatre (*Alternate* I) Shri Vivekanandan S. (*Alternate* II)
Uttar Haryana Bijli Vitran Nigam(UHBVN), Panchkula	Shri Uttam S. Mane
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In Personal Capacity (*New Delhi*)	Shri N. S. Sodha
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BIS Director General	Shrimati Reena Garg, Scientist 'F'/Senior Director and Head (Electronics and Information Technology) [Representing Director General (*Ex-officio*)]

Member Secretary

Ms Alismita Khag
Scientist 'C'/Deputy Director
(Elecrtonics and Information Technology), BIS

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